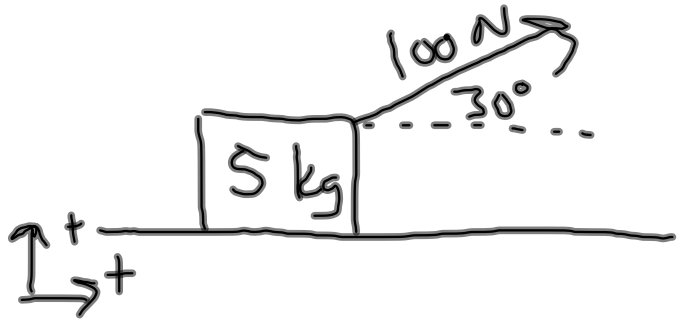
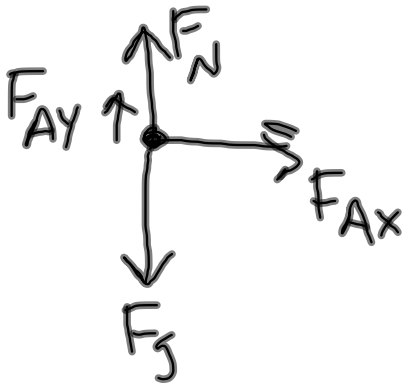
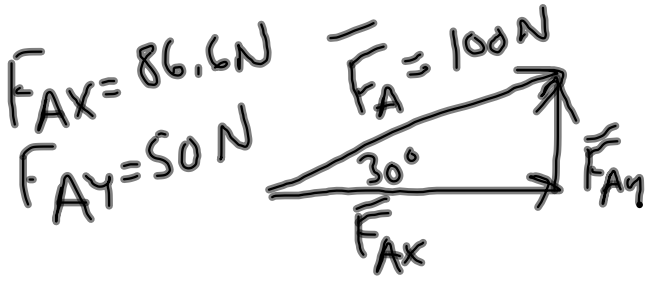
Exam Topics:

- Graphing
- Kinematics
- Momentum
- Forces
- Vectors
- Work, Energy, Power
- Waves, Sound, Light
- Electricity

A box with a mass of 5 kg is pulled horizontally with a force of 100 N at an angle of 30 degrees. If there is no friction, what is the acceleration of the box?







$$\Sigma \bar{F}_x = m\bar{a}_x$$

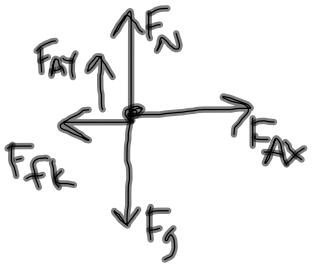
$$F_{AX} = ma_x$$

$$a_x = \frac{F_{AX}}{m}$$

$$= \frac{86.6\,N}{5\,kg}$$

$$= 17.32\ m/s^2$$

A box with a mass of 8 kg is pulled horizontally with a force of 100 N at an angle of 30 degrees. If the coefficient of friction is 0.25, what is the acceleration of the box?



$F_{AX} = 86.6\ N$

$F_{AY} = 50\ N$

$$\sum F_x = m a_x$$

$$a_x = \frac{\sum F_x}{m}$$

$$= \frac{F_{AX} - F_{fk}}{m}$$

$$= \frac{86.6N - 7.1N}{8kg}$$

$$= 9.93\ m/s^2$$

$$F_{fk} = \mu_k F_N$$

$$= (.25)(28.4N)$$

$$= 7.1\ N$$

$$\sum F_y = \emptyset$$

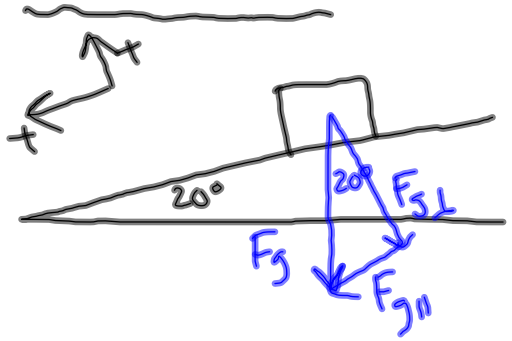
$$F_N + F_{AY} - F_g = \emptyset$$

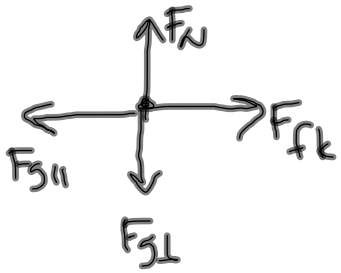
$$F_N = F_g - F_{AY}$$

$$= (8\ kg)(9.8\ m/s^2) - 50N$$

$$= 28.4\ N$$

A box with mass of 15 kg is sliding down a ramp with friction. The box is sliding down with a constant velocity, and the ramp has an angle of 20 degrees. What is the coefficient of kinetic friction between the box and the ramp?





$F_{g\parallel} = F_g \sin(20°) = 50.28\,N$

$F_{g\perp} = F_g \cos(20°) = 138.13\,N$

Const. velocity

$F_{fk} = \mu_k F_N$

$\mu_k = \frac{F_{fk}}{F_N}$

$= \frac{F_{g\parallel}}{F_{g\perp}}$

$= \frac{50.28\,N}{138.13\,N}$

$= 0.364$

$\sum F_\parallel = \emptyset$

$F_{g\parallel} - F_{fk} = \emptyset$

$F_{fk} = F_{g\parallel} = 50.28\,N$

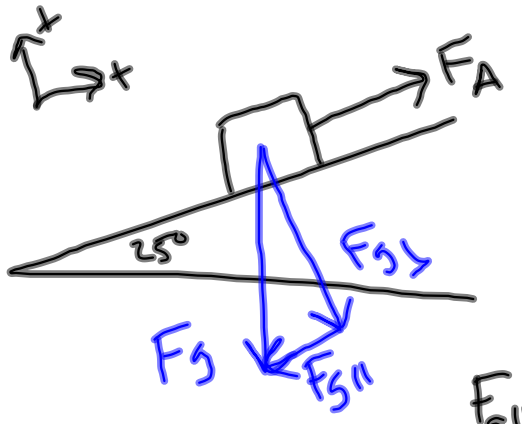
$\sum F_\perp = \emptyset$

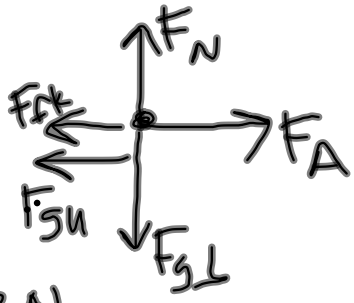
$F_N - F_{g\perp} = \emptyset$

$F_N = F_{g\perp}$

$= 138.13\,N$

A box with mass of 8 kg is pulled up a ramp with some force. The ramp makes an angle of 25 degrees with the horizontal, and the coefficient of kinetic friction is 0.200. What force is necessary to pull the box with a constant velocity?





$F_{g\parallel} = 33.13\,N$

$F_{g\perp} = 71.1\,N$

$$\Sigma \vec{F}_{\parallel} = \emptyset$$

$$F_A - F_{fk} - F_{g\parallel} = \emptyset$$

$$F_A = F_{fk} + F_{g\parallel}$$

$$= 14.22\,N + 33.13\,N$$

$$= 47.35\,N$$

$$F_{fk} = \mu_k F_N$$

$$= (.2)(71.1\,N)$$

$$= 14.22\,N$$

$$\Sigma \vec{F}_{\perp} = \emptyset$$

$$F_N - F_{g\perp} = \emptyset$$

$$F_N = F_{g\perp} = 71.1\,N$$